

REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

To place the subject application in better form, the specification has been amended to correct minor informalities. Also, a new abstract is presented in accordance with preferred practice. No new matter has been added by these changes.

Claims 1-15 are presented for consideration. Claims 1 and 11 are independent. Claims 1, 7, 9 and 11 have been amended to clarify features of the subject invention. Support for these changes can be found in the original application, as filed. Therefore, no new matter has been added.

Applicants requests favorable reconsideration and withdrawal of the rejections set forth in the above-noted Office Action.

Claim 15 has been rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,864,142 to Muraki et al. Claims 1-9 and 11-14 were rejected under 35 U.S.C. § 103 as being unpatentable over the Muraki et al. patent in view of U.S. Patent No. 5,717,482 to Akutsu et al. Claim 10 was rejected under 35 U.S.C. § 103 as being unpatentable over the Muraki et al. patent in view of the Akutsu et al. patent. Applicants submit that the cited art, whether taken individually or in combination, does not teach many features of the present invention, as previously recited in claims 1-15. Therefore, these rejections are respectfully traversed. In addition, Applicants submit that independent claims 1 and 11, for example, as presented, amplify the distinctions between the present invention and the cited art.

In one aspect of the present invention, independent claim 1 recites an electron beam exposure apparatus which exposes a substrate with a predetermined pattern using one or a plurality of electron beams.

In another aspect of the present invention, independent claim 11 recites an electron beam exposure apparatus using a plurality of electron beams.

Independent claims 1 and 11 recite apparatus, which includes a substrate stage on which a substrate is mounted, a transfer stage which drives the substrate stage on an X-Y plane, an electromagnetic actuator which drives the substrate stage, in a rotation direction about a Z-axis and a direction perpendicular to an array direction of the plurality of electron beams, with respect to the transfer stage, and a measuring system which measures a position of the substrate stage in the rotation direction about the Z-axis using a measuring beam along a direction perpendicular to the plurality of electron beams.

By such an arrangement, the present invention recited in independent claims 1 and 11 can minimize degradation in drawing accuracy caused by a yawing component generated in the stage of an electron beam exposure apparatus using a plurality of electron beams.

Applicants submit that the cited art, whether taken individually or in combination, does not teach or suggest such features of the present invention as recited in independent claims 1 and 11.

The Examiner relies on the Muraki et al. patent for teaching an apparatus that includes a plural electron beam exposure apparatus having a θ-Z stage 11 and an X-Y stage 12, as shown in Figure 1 of that patent.

The Examiner relies on the Akutsu et al. patent for showing a substrate assembly 100 that includes a tilt stage and an X-Y stage supported on a Z or tilt stage. The Examiner relies on Figure 1 for showing a substrate (wafer 3), a tilt stage 1, an X-Y stage 6, and a Z linear motor 5, including electromagnetic actuators 5a and 5b. The Akutsu et al. patent also shows a laser interferometer 9, which measures X-direction, Y-direction and Z-axis-rotation-direction position of a position measuring mirror 7a arranged on the tilt stage.

Applicants submit, however, that neither the Muraki et al. nor the Akutsu et al. patent teaches or suggests the salient features of Applicants' present invention, as recited in independent claims 1 and 11, including a measuring system which measures a position of a substrate stage in rotation direction about a Z-axis using a measuring beam along a direction perpendicular to a plurality of electron beams. Accordingly, the cited art should not be read to anticipate or render obvious Applicants' present invention recited in the independent claims.

For the foregoing reasons, Applicants submit that the present invention, as recited in independent claims 1 and 11, is patentably defined over the cited art.

Dependent claims 2-10 and 12-15 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicants further submit that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejections set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010 All correspondence should continue to be directed to our address given below.

Respectfully submitted,

  
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